# Aviation Week & Space Technology





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#### WHAT DOES A PUMP MAKER KNOW ABOUT ATTITUDE CONTROL?

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fluid dynamics, and (Z) proved ability to manafacture highly reliable sub-suderns and components in meet

Performance proof is available both on procrasts metated by Veders and those undertakes for the

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This computer system has been called "the most trouble-free piece of electronic gear in the U.S. Navy today."

#### Quick! What company makes it?

Data System (NTDS) will tell you: UNIVAC. vers, an Admiral recently called this system Navy eyer got its hands on ... the most reli-

able large-scale system in the fleet today." UNIVAC is responsible for the NTDS comouter, the peripheral hardware and for the What does NTDS do? It automatically

locates and tracks enemy targets, provides for their identification and supplies high-

high-capability integrated information

processing and transmission system, the reliability of NTDS will help assure U. S. naval Is capability like this unusual or un-

secomon at UNIVAC? Not at all From yeaterday's ENIAC and BINAC to today's fluid thin-film magnetic memories. UNIVAC has made most of the industry's major technical advances. Univar offices a colicle response to every demand., outstanding scientific and ming and management capability. If you'd AVAITON WEEK & Spece Technology

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Packard Ball Electronics' Saturn Automatic Checkout System

#### How the Friden Flexowriter' controls its man-machine communications



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This stabilizes the tread rubber when propose of fitting united AW-75, Alone 18, Ohio.



#### help scientists study energetic particles in space Bases land SCA Phenocolisidae Dron RCA-6035, -6635, and -6163, organidy beams

- # The desert of electrons with searning above 40 KEV on the outer zone was about A long population of trapped persons having compare of a few bunders KEV sinks in the region from 4.000 miles shows the factor of the first to the cuter edge of the bursters region. Moreover, the first to the cuter edge of the bursters region. Moreover, and the first term of the fi
- o the Explorer experiments began in 1858, BCA has worked closely with NASA's Polids. Purious Branch in the Goddard Street Plaths Cepter, as well as with Dr. James Van





#### PHI SED LIGHT TECHNOLOGY

#### Need a light?

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for McDonnell Arrents Corn-

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Command Recovery, Territal control and landage of appropriate process management, data links, cocket displays for servence missions. These are not sent "lang-races objectives" at Spercy Phonoic. For example, we are under contract with USAF Auronaufter! Systems Divinion to capture the X-20 Data-Sour vehicle upon re-corry from space, then manage its let-down and landing. This will be doze with Sperry microwave guidance and control equipment existing today. We believe

of Source Photography appropriate in body-serformance printless flight ... consciunds process to death and breadth than that of any other company. We resicone new shallowers in these and related fields. SPERRY PHOENIX COMPANY, Phoenix, Avisons.



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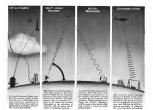






MOTOROLA Military Electronics Division

As each represent produce.



#### 4 steps ahead in scientific problem solving

Everything new about the four systems rep-These accomplishments are typical of the resented here has expanded the countilities of science, defense establishments and architect, or For example, the CRC Refrictmenter has

fraction radex .. with direct application in the tracking of policine and satelline about dates. tion and the study of weather. The CBC Dirital TV System allows further video nignal processing storation intelligence with which Colorado Research is opproaching a variety of related problems. Work my techniques and been pretramentation research.

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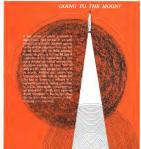


THE NEW CRAFTSMEN. Downs are not made for sensing millioning of an inch. Not can the own determ such tolerances. Yet every day the psoduction workers of today's acrospece industry turn out instruments and compo-

Though they deal in variances as fine as a wave length of both, these men are proper scientists not engineers. In Behind this effort, shaping the techniques that make it possible, are the industry's production experts. Clear-sighted

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These are the new craftsmen—the men-on-the-line in a space-up world. North American Aviation is at work in the fields of the figure through these distribute Science Center. Alomics International, Autoartics, Columbus, Los Angeles, Rocketiftes, Space & Information Systems.



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The U.S. Are Free, has selected the Bell UB-I to fulfill in results of support research, reliefue filter strends better operand. Indicated in the second served. In US-I filter, present produces of confidence for the second research. But for 164 belong receiver professors of confidence filter for the second receiver filter for the second receiver for second receiver for the second receive







#### The tape with the built-in duster!

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#### Life support for 14 days in space

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23



To optimize a TWT...use a crystal ball



"Perglytic deposition" is the fancy same for it. In simpler terms, it's Spany's method of using heat and a port rods in a very prepar militier. Result: higher pain and improved efficiency for Speny traveling wave tubes, This is only part of the Sperry offset to optimize the electrical parameters of TWTs. Attacastors are importert . - beam focusing, amplitude fine structure, and programs are devoted to a single objective . . . the pro-duction of TWT's with a near-perfect mix of electrical

Many of these efforts are already bearing fruit in the STL-405 and STS-101 (200 W performance own oction bendwidth at L and S bands) and the STC-278 A NEW TECHNICAL PAPER gives full engineering and scientific details of the considerations involved in cons, write Source, Guinescalle, Florida, ne contact your

Europe Contraental Paris,





The SR 16 is available in SPDT and DPDT

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#### Tamar: three typical contributions to electronics

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SAMON NEW JOSEP LES ANGUES, CHAPTERS

#### nothing but talk...talk...talk...

LEACH SATELLITE RECORDER/REPRO-DUCERS are now in orbit storing lots and lots and lots of data . . . playing back when consumption of only 4 watts.

The unit shown here records on 14-inch Mylar-base magnetic tape up to 210 minutes at 1.8 ips . . . transmits back to earth itself and records all over seein Seven pounds light and seven inches narrow, this Leach Satellite Recorder/ Reproducer has taken the rockiest faunch

in stride, works in temperatures from -30°F to 130°F with an average power

If you're in the satellite making business, you should make it your business to know more about this recorder/reproducer and how it can be adapted to your needs. Leach. You will set complete specs on this specially engineered recorder as well as other high environmental tape recorders-





Radar Fingerprint Expert. 30305 a at Integrated, models and electronic/microwave instrumentation system for Spectrum Measurements. Spectrum Surveillance and Societystric Manning III provides the stircols, ecoelwers, programming, control, measurement, and text functions for the determiaution of electromagnetic radiation and susceptibility of all RF systems C Braigally the engineers counsts of a combination receiver-spectrum analyses, high and low power signal corner and necessary test entennes, data recorders, and applifiery excitment. C Problems solved in designate the spectrum elemeters measurement system provides awalled background and recessive experience for martine somethers exitens development. This experience, this related research and development, clearly places Searce (Classicaler up a venue position - with assistance and production carability for enectron surveillance systems. C For additional information and MGMS boschure.





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#### **ELECTRO-COMBUSTION DEVICES AND SYSTEMS** for land sea and space applications













essibly exerved skulls on a long marblished precision. and envertemental testing and entrymentation-







#### Will it penetrate? Maybe...in a hundred years!

#### **3**M DUNNESOTA MINUNG E DANUFACTURING CO.



A spec cost docks in the Douglas daugned module of an assembled space scaling. As new members go about routine dates, one crevenus in size module's lower cubin in pravity-conditioned on a countries.

## How do you reduce the cost of building a manned space station?

...another complex problem which Douglas and the aerospace industry are helping NASA solve The race for space supressacy is too critical to risk victory by pinching prantes. But the men most concerned also know that success depends on squeezing

cerned also know that success depends on squeekly every owner of what from the follows and shill inverted. An example of this is a Doughts proposal for a wayto suffice expended whichin which will already be in orbit (life: Source S-IV and S-IV B mile) in builting squee instances from which various space missence could be learnered. The method would interply out the great expense of learnering method proposests to sever as made have a matter and followingster. These and offices.

would also be arrest.

As conceived by Douglas engineers, key element in the new sechange is the SPACEBALL, a unique

modelar space vehicle early boosted aloft. SPACE-BALL would be designed to link expended space vehicle stages and dock many types of space craft. - like the Genzus and Apollo capsules.

whiche stages and dock many types of space emitslike the Germai and Apollo expedies.

Any number of these modular units could be joined to provide space stations or even space shaps of almost any size that much be needed.



Mayor Desploy Divisions are located as Louis Massics and Long Bonds,



## How can we support life in this anti-life void?

So far, men hes entered space for only a few brief aghits. The real problem is to support him in comfort and safety over long stretches of time while he performs useful missions. Nothing is friendly to flesh end blood in this savage vecturn. If men is to conquer it, we must build him a little world of his own-then shield it from the vold. We must know how to protect him from radiation and meteoroid impact...keep the partiel pressures of his enclosed atmosphere finely balenced. prevent cebin temperatures from building pest the point of tolerence...prevent disorientation and claustrophobia... keep tensions from building up between arew members. A life-support system carnot be developed by bits and pieces. It requires a total systems approachwhich no organization is yet oble to provide. But the Research and Development Division of Lockhood Missiles & Space Company has been steadily building toward this roal, and now stands on the verge of total competency in life-support systems for space.

#### Lockheed

A Group Division of Leekheed Alvault Corporation

#### Guidepost

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First solumantes to space whickes, many "mostleable" transformental problems are now leng solved by reinforced plantes. Do you have a low temperature pressure vision of or humber need? Are your high temperature rating proferrance characterisations stymed by link of an electronic warfore resistent ofpolite of withstanding the hard? Do you need in high pressure? Personnick's Defense Profests Drosses into how the solution is year transformental, eletrop how the solution is year transformental, eletropic and sincetenic problems. Expension gazzed on programs such as F4H, ASF, Fultras, Falcon, underwater 'bored find' and Braummick, It-berrap silves work him established a devolucionent and musifications facility when is a broker in its field.



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200 g's vs 1 TWT



...that's when push comes to shove!

Recently, an MEC conformer told us about a real 200 g a peak acceleration was thrust upon it. The

Spally minded, MIDC has shipped over 4,000 metal mapers magnetic ensonance TWT's SWO's and



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space exploration is under construction in contractor for angingering and design The NASA site is only a few miles from the headqueriers of this world-wide engineering and construction engrass. Over 800 andour necessanced stell at the Houston base. the Houston area...as Brown & Root, Many companies related to the space effort are moves to this area. Perhaps your company is one of them if so, we can save you time and money in the fields of plant location. design, genetraction, purchasing, and mainterange. We invite your inquiries.



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#### BIGGEST SPACE CHAMBERS BUILT... BY PDM

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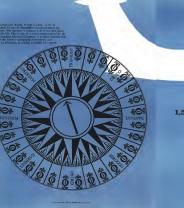












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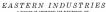
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Space man

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#### SIMMONDS SYSTEMS WILL MEASURE ALL THREE

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TARRETORIE, NEW YORK IN MANAGEMENT HAS A PROPERTY AND A STREET, N. C.

#### **Aviation Week** & Space Technology

MANNED SPACE BUILDING

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Apollo Reflects U.S. Technical Shill Apollo Lusar Mission Pictured Critical Applie Test Madules Produced 121 Preliminary Design French on Louar Bog. 141

Genelal Evolves Into Operational Program 175 Genind Silvenory Day to Vorsely of Courses 127 Combilities of Man Influence Genini Design 184

Gentlet to Be Readerson Proving Ground 195 Mercery Shaped Value of Pilor in Space 197 Mercery Treets Space Piles Techniques

Thinking Matures on Militery Stones Role USAF Circs Top Priority to Space Statum 214

Air Force Will Have Small Rule in George 221 X-20 W-3 Peobs Pitered Lifting Recentry 230 DenoSear's Illusery Full of Re-commissions 233 Accommendate May Be Tunistane Vehicle 245 DATE School Yorks Fators Space Pilote - 953

Astronomic Trained to Be More Then Pilets 263

Mission Control Resira New Soute Art...... 274 Internation, Reliability, Checkens Challenges 290 Modified Boone 377 to Hard Sci Stores .... 201 Lorge Vehicles Change Blandling Concepts 303

Vestel, Flights Widen Souge Experience 315 NEWS OF THE WEEK

COVER. Final Mercury Mission, NAS, begins its Sight from Cape Causteral, Fig.

## Space Flight Enters New Period to Exploit Man has taken ble fart could steps beword realise that he had been a second and the had been a second when digits of face Mercury coulder state from the face of the second when digits of face Mercury coulders state from the face in which of the determined the face of the second when digits of face Mercury coulders state from the face in which of the determined the face of the face of the face of the second when the face is the face of the determined the face of t

United States and the Saviet Union are committed to extending man's conshility for appreting in decade, with the goal of exploring Mary leoming with increasing attentity as an abjective to be reached before the 26th Conturn's end The world is well beneful into the ore of massed space flight. Little is known about the technical results arbitrard in the Soviet Vantok demonstrating sound capability for mounted spece operations. Project Mercury, which finished last May 16 with the 22-orbit flight of Mol. Gordon ore this nation has ever executed. It exceeded all of perfect safety record and once by initial incusts was overcome, it elicked off its schedules with admirable precision. The poce of manned snace flight to quickening, its scope in companion a special editorial task force at this time for an intensive three-mouth effort to divill the evenes of knowledge gained from the pioneer ventures in memord space flight, to report on the neuerous of the future programs already under way and as perceive its future noths as clearly as nearlible from this point in time. These findings are reported in the subsequent pages of this issue. The Apollo manned lunar landing program to which this nation is now firedy committed is an effort more technically campley and managinally demanding by several orders of magnitude than such programs in the Manhatton Project to develop the atomic bomb, or the projects which resulted in the creation of the intercontinental hallfurio missile. Apalla has been should so for President Kennody's determination in May. 1961, to establish the manned luner landing road to support it fully through as much of its critical

development phase as his tenure in affice might

National Aeronautics and Space Administra-

tiem's decision in July, 1962, to switch to the

banar erbit rendezwen technisms as the method

to achieve menned hunar landing substantially

New the Apollo program is facing a third decicine phase in which will be determined the moneye of public apparet (reflected in conpressional appropriations) that it can expect to have during the most critical phase of its technical development progress. When President Kennedy called for the Apollo progress as a toppriority national coal, he made it clear to Conprogram through a seven to 10-year phase of possible. Congress responded to this shallenge with virtually unonimens cadersement of the NASA hudget for Fixed 1963. Initial successes orbital flight whipped public cuthorison to an canally high ritch. Some of this cuthasiasm and glomor is already firding, particularly as the main focus of the manned space thight effort shifts from spectacular orbital shots projected by intercontinental teleaperial and hardware development problems that must be solved in the next few years. Achieving the Apalla coal requires no new scientific discoveries or major technical breakthroughs. Its

problems are primarily engineering, management and funding with salutions emply dependent on industry. NASA and the resblic-Apollo is not proceeding at a "crash program" pace in the sense of the military ballistic missile effects. But it is an effort that must be neahed at its maximum feasible technical page if it is to retridence may of the dividends its immediately make possible. Mented space flight has just emerged free its Kitty Hook stars and is progressing at a pace so regard that it is different to measure he it is worth notice that it was in 1947 that Cal. Charles Yearry first first yout the speed of count -shout 760 mah. at sea level. A decade later, in 1967, Sputnik I achieved an orbital speed of 25,000 mals. A decade after that in 1967 we expect to be ready to assay earth escape velocities of 25,000 mpb, in the Anollo lunar trajectory, Clearly, this decade is no time for the American public or its leaders to lose the courage of their consistions that took them into their initial onecover with mounted space field It would be a national trapely for public and constrained support for Apollo to fail at the

very time that the erestest technical stricks were

## Capabilities of Man for Probing Universe being taken in the Internation, fromtes and two ing grounds, second selectures of its goals. With the foundations for monthly specifically by Norrens, and with Apolith pushing

NASA affireds and industry leaders must suggest have recombility for making the simplespecof this phase clear to the public that is naving the hills and to report promptly and accorately on There is certainly no sign that the Saviet Union bilities for respect story fight operations at though there are some indications they also to reach their ultimate male by different noths than see home chosen. It may well be that they will laboratory as their next sten before shooting for velopment accorded a later priority. Only hastory will be able to tell which course is the poser. although it is certain that both operations will be necessary for a medal manned space capability. A staler policy problem that must be solved is the inevitable growth of the military role in manned space flight development and its interration with the effects already under way in NASA. entire manned more flight research and develop-

sered lead has meltied at about the same rate no toplevel Defense Dept, despisions never the noes if for manused military space flight capability has disipped,
Initial effects at NASA-DOB Balance produced sence educational shocks in both agencies. As o routh three gave approve to be a possibility for a source residince formulation on which is developal fully effective national space program as a plant control of the produced of the program of the protent of the produced of the produced of the protent of the produced of the produced of the protent of the produced of the produced of the protent of the produced of the produced of the protent of the produced of the protent of the produced of the produced of the produced of the protent of the produced of the produced of the produced of the protent of the produced of the produced of the produced of the protent of the produced of the produced of the produced of the protent of the produced of the produced of the produced of the protent of the produced of the produced of the produced of the protent of the produced of the produced

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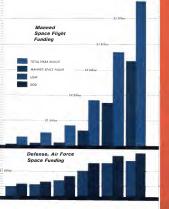
for the named exploration of space. Manned many flight president will above be tremendously across an extremely broad spectrum of technology, It appears unlikely that this nation or any other will be able to corry a large number or wide variety of manual space flight nearrows sincel their finencial and technical mosaitude. But, while the current coals are being translated into pleasure and laying the technical have for the Thru in 1968, at the time that its revier effort is devoted to developing the Apollo system, the policy-makers of this country must make some hosis decisions on what comes after Analla and a Preliminary scenarios of the technical horizon brings the multi-reserved space station shorply notional expobility in manned more operations Most of the book hardware required for this effort to absorbe below developed to the Anella program The multi-manued orbital annea station offers an extremely wide variety of uses for both military

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### **Future Programs**



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## U.S. Facing Decisions on Manned Flight

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begin.

This has become the "year of ne-communition" for a space offset that, after President Keunedy's approval of the Apollo programs easy in 1961, necessed to be out of its uncertain additioners at less and on its way to acceptance as a verial nectional registeries.

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## Scientific Debate Focuses on Apollo Landings

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## NASA Building Space Station Technology

National Accountries and Source Administration has become to develop a. Messary program at Apollo luxus mabroad technological formistics for a manual space station, which it feels certain will be the next major replect to be inflinted. The effort at this time peroless seroud two concepts, which can be estecorred to mad laboratory vs. large station. Studies will be completed in the next year by NASA. As Force and industry in an attenual to double a hone comber of time confirmation and executional moreowher was hardware

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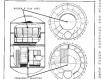
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## Future Bioastronautics Research Outlined

## Space Laboratory Needed

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#### Life Support Debate





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## Potential of Lunar Base Being Studied

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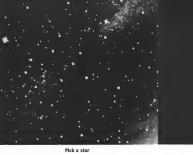
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## Perfect Atlas Record in Launching Manned Mercury Orbital Flights...





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...Case Study in Demonstrated Reliability in a Major Space System

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The latest outgrowth of the continuing Alliprogram in the United States facts Sendanted Space Laureth Vehrels, Adlas SLV-3 Adlas SLV-3 is almostly specified, and in production, for several ISAF and ISASA space programs, involving over 20 laureches. Each SLV-3 is induced to specific polorads and fight profules with "playin" justsure, pregnanting, internet, reaching and other coroporates...yet without affecting the histophy of both and sufficiency to committee the program of the state sufficiency to the state of the program of the state sufficiency, committee the Marray-Adlas and more than 100 other filinits.



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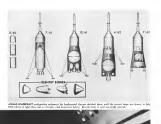
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## Critical Apollo Test Modules Produced

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AVAILAND WEEK & SPACE TECHNOLOGY, July 27, 1942







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Control Devices

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Projected space missions levelying upper state starable

1 The propellant must be souce-storable Future Builds will 2. Engite which will be critical, particularly when the task

3. Specific impulse must be improved over the current

6. Variable throat control will be required for more unexhibitive # At United Technology Center we are now devoting major

Now fluorise based propellants, proved in more than 20 recent test belows at UTC, provide 20 25 %, higher law.

Ergine weight has been reduced significantly by using frameri wound propellant tasks and highly efficient ablation.

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VIATION WEEK & SPACE TECHNOLOGY, No. 12, I

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fight-seth angle of the Morcury-Atlan vehicle as it places the graft into orbit. Supposed in its command parformance at owner Marriago-Alica lagredome.

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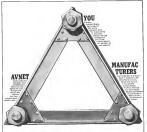
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AVIATION WEEK & SPACE TECHNOLOGY, No. 22, 1843.





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AWARDON WEEK & SPACE TROMOLOGY, 1-In 22, 1013.

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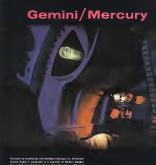
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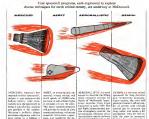
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## necessary for the achievement of U. S. leadership in space MCDONNELL



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AVAILON WEEK & SPACE SECHNOLOGY, AU- 22, 1912

## Gemini Slippage Due to Variety of Causes

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# Four basic explosive actuators...and how to use them effectively. Employer devices are being used more and more

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# Man's Capabilities Affect Design, Mission

Hoseton-Conviction that man is the best controller is the foundation for craft, and it has had a significant effect on the schability and sampliests of the hardware in this program. This belief steam directly from the experience raised by the National contractor, from the Moreney project. Extracre setemation in the one-man spececraft gasde it an corwackly vehicle to design, beild and use "The suppos-

tial elevatry (in Mercury)," said our NASA official, "was a real wirltmare with all its redendant and smalled coveres."



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# Gemini to Be Rendezvous Proving Ground

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AWARDN WEEK & SPACE TECHNOLOGY, July 22, 1943

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# Mercury Showed Value of Pilot in Space

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ASTRONAUTS Cooper (right) and Glean



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# Mercury Taught Space Pilot Techniques

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#### USAF Gives Space Station Top Priority Washington-Air Force has firmly decided to focus its manuel space flight.

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AVAILAN WEEK & SPACE TROHNOLOGY, July 29, 1963



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PERMANENT SPACE STATION, culoi Output III, was conceined in General Description source. About 200 it long and weathing 50,000 its the treasing facility would be



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#### Air Force Will Have Small Role in Gemini Air Force's part in the early years of Papiert Coming will be usual less than proceed automatic sources on as to

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#### USAF Problem

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AMPLIFICATION/DISPLAY OF TRANSDUCER SIGNALS Compact probable and includes emplates for transducer as 100th Sec. X-Y RECORDING

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RECORDING READOUT AND DATA MARDLING



SANBORN COMPANY

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THIS IS NOT THE THERMOCOUPLE

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THE LEWIS ENGINEERING COMPANY Speciality in Electrical Terrangulary Managument Naugatrick, Connecticut



What kind of missile is this?



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For a missile to be effective it must in a government sponsored test last-have a dependable guidance system ing 46,900,000 operational hours?





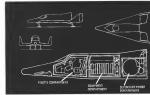
DYNA-SDAR codest layer and details are shown in this morkup. From windows will be shadded as fight firmuly empy.

Derton-Boring X-30 (Dyna-Soar) boast glider, a accord generation space which intended to explore printed lifting secutes, is expected to begin laving the recent for technical and industrial recondenses that would realise the Alt Although X-20 is a research vehicle asther than a prototype malitary matern, its dearn is flexible enough that it could be used for a veriety of petrotial reflicer missions such as ferrome men and victorials in some, surveillance,

differ from X.25, according to Jack Tree-boles, deputy director of the X.20 essed's Actounteed Systems Dry Main objectives of the Dyor-Sair \*Demonstrate controlled lifting to

X-20 Will Probe Piloted Lifting Re-Entry The law footport offen military

A Douglas FSD has been confirmed Wrose and further are built to an



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### Dyna-Soar's History Full of Re-Examinations

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#### for Space Information Systems, strength favors General Precision







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AMARION WEEK & SPACE TECHNOLOGY, July 22, 1912









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### AME Leunch

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### New Goddard space test chamber goes into operation

NASA recently put into service the Dynamic Test Chuesher (DTC), foreground above, at Goddard Scane Phylis Coddyne's Space Monography Spreadston later date. These two lif-ft discreter, collegated solar simulator, is capable of

On the basis of successful experience on nystems for both the SES and D76 Stokes offers unione total complekty in

Space Systems Department, F. J. Stokes Corpotenters, if attained the 10 " Tury scale. | ration, 5500 Tetur Boad, \$85adalable 00 Pa

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 Fixed 1902-5100 radios. The firms. eopeocratish 567 million sheet of the Fread 2903—5130 million Arrents.

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### A solenoid valve that operates at -423°F or 1000°F

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VALCOR ENGINEERING CORP DE 5-9665 (Ame Code DOC)

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### aerospace systems management

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### √They take Dimazine (UDMH) for granted these days. That doesn't surprise us a bit. We make it.





## AerospaceplaneMayBeTwo-StageVehicle

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The second store will be recket necessal. It will be either a winned vehicle Her the Dona-Sour X-M elifer over n. 25th or a high-volume lifting body with in acrodynautic shape (see gietzie above).

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## USAF School Trains Future Space Pilots

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## Mission Control Begins New Space Art

integration of man and machine, requiring a high degree of human and electronic canadally both on the ground and in the spacecraft. Operational procedures for advanced passaged missions is one of many space arts born, developed and tested in the Mescary pencet. Mercary has last the well as what to do in fature German. Apollo, move station and observery flights.

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Apollo Testing To Begin at White Sands



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## As Key Apollo Challenges



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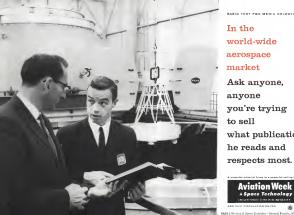
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Comments are due July 25, and the RFP 29 is outlined in three phone and rolls

AWARDN WEEK & SPACE TECHNOLOGY, July 25, 1942

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#### Probers Told Navy Seeks More F-111s By George C. Wilson Bacon supported to a counciety wife

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AVERDON WHEE & SPACE TRO-HOLOGY, July 22, 1943

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XV-4A Hummingbird Starts Haver Tests

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O NEWS OF THE WEEK British Stress Science in Defense Shuffle By Herbert L Colerain

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## Jamaican Carrier Using Twin Bananza

## New Filter Planned for P.1127

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